

WHAT IS CLAIMED IS:

- 1 1. A method for purifying viruses from solution, the method comprising:
2 (a) combining the solution with an anionic polyelectrolyte;
3 (b) combining the solution with a cationic polyelectrolyte; and
4 (c) centrifuging the solution to obtain a supernatant and a pellet, wherein the pellet
5 comprises the virus.
- 1 2. The method of claim 1, wherein the anionic polyelectrolyte is selected from the group
2 consisting of glycosaminoglycans and polysaccharides.
- 1 3. The method of claim 2, wherein the glycosaminoglycans and polysaccharides are
2 sulfated.
- 1 4. The method of claim 1, wherein the anionic polyelectrolyte is selected from the group
2 consisting of chondroitin sulfates, heparin, heparan sulfate, keratan sulfate, carrageenans,
3 fucoidan, poly-L-glutamic acid, poly-L-aspartic acid, poly(glycolic acid), poly(lactic
4 acid), and poly(lactic-co-glycolic acid).
- 1 5. The method of claim 4, wherein the anionic polyelectrolyte is chondroitin sulfate C.
- 1 6. The method of claim 1, wherein the cationic polyelectrolyte is a cationic polymer that
2 complexes with the anionic polyelectrolyte.
- 1 7. The method of claim 1, wherein the cationic polyelectrolyte is selected from the group
2 consisting of (diethylamino)ethyl dextran, histones, protamine, poly-L-arginine, poly-L-
3 histidine, and poly-L-lysine.
- 1 8. The method of claim 1, wherein the cationic polyelectrolyte is hexadimethrine bromide.
- 1 9. The method of claim 1, wherein the solution further comprises proteoglycans.

1 10. The method of claim 1, further comprising separating the pellet from the supernatant, and
2 then resuspending the pellet in a resuspension buffer.

1 11. The method of claim 10, wherein the volume of the resuspension buffer is no greater than
2 one-tenth the volume of the solution, thereby resulting in at least a ten-fold concentration
3 of the virus.

1 12. The method of claim 10, wherein the volume of the resuspension buffer is no greater than
2 one-hundredth the volume of the solution, thereby resulting in at least a one-hundred-fold
3 concentration of the virus.

1 13. The method of claim 10, wherein the resuspension buffer comprises phosphate-buffered
2 saline.

1 14. The method of claim 10, wherein the resuspension buffer comprises cell culture medium.

1 15. The method of claim 10, wherein the resuspension buffer comprises a pharmaceutically
2 acceptable carrier.

1 16. The method of claim 1, wherein the virus is a retrovirus.

1 17. The method of claim 1, wherein the virus is an enveloped virus.

1 18. The method of claim 1, wherein the virus is selected from the group consisting of human
2 immunodeficiency virus, lentiviruses, Moloney murine leukemia virus, herpes simplex
3 virus, Epstein-Barr virus, human cytomegalovirus, influenza viruses, poxviruses, and
4 alphaviruses.

1 19. The method of claim 1, wherein steps (a) and (b) are carried out in reverse order.

1 20. The method of claim 1, wherein steps (a) and (b) are carried out simultaneously.

1 21. A method for preparing a formulation for administering a nucleic acid molecule to a
2 patient, the method comprising:
3 (a) obtaining a solution comprising a virus that comprises a nucleic acid molecule to be
4 administered to a patient;
5 (b) combining the solution with an anionic polyelectrolyte;
6 (c) combining the solution with a cationic polyelectrolyte;
7 (d) centrifuging the solution to obtain a supernatant and a pellet, wherein the pellet
8 comprises the virus;
9 (e) separating the supernatant from the pellet; and
10 (f) resuspending the pellet in a resuspension buffer suitable for injection into a patient to
11 prepare a formulation for administering a nucleic acid to a patient.

1 22. The method of claim 21, further comprising:
2 (g) separating the virus from the polyelectrolytes.

1 23. The method of claim 21, wherein steps (a) and (b) are carried out in reverse order.

1 24. The method of claim 21, wherein steps (a) and (b) are carried out simultaneously.

1 25. An assay method for detecting the presence of a virus in a sample, the method
2 comprising:
3 (a) obtaining a sample to be assayed for the presence of a virus;
4 (b) combining the sample with an anionic polyelectrolyte;
5 (c) combining the sample with a cationic polyelectrolyte;
6 (d) centrifuging the sample to obtain a supernatant and a pellet, wherein the pellet
7 comprises the virus, if any; and
8 (e) assaying the pellet for the presence of the virus.

1 26. The assay method of claim 25, further comprising:
2 (f) resuspending the pellet in a buffer solution.

1 27. The assay method of claim 25, further comprising:

2 (f) separating the virus from the polyelectrolytes.

1 28. The method of claim 25, wherein steps (a) and (b) are carried out in reverse order.

1 29. The method of claim 25, wherein steps (a) and (b) are carried out simultaneously.

1 30. A kit for use in concentrating or purifying viruses, the kit comprising:

2 a tube of a suitable size and shape for use in a centrifuge;

3 an anionic polyelectrolyte; and

4 a cationic polyelectrolyte.

1 31. The kit of claim 30, further comprising instructions for use.

1 32. The kit of claim 30, wherein both polyelectrolytes are supplied in a single tube.

1 33. The kit of claim 30, wherein the anionic polyelectrolyte and the cationic polyelectrolyte
2 are supplied in two separate tubes.
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